

SCIENCE

FRIDAY, AUGUST 31, 1888.

SOME VERY INTERESTING INQUIRIES are suggested by the statistics of the enrolment of pupils in the private schools of the country, which will appear in the forthcoming report of the National Bureau of Education. These statistics are necessarily very fragmentary, and some of them bear internal evidence of their incorrectness. But in a few States the reports are sufficiently full to indicate a tendency, at least. In Vermont, for instance, there was a decrease of .36 per cent in the enrolment of children in the public schools, while the enrolment in the private schools increased 3.57 per cent. In Connecticut the increase in the public-school enrolment was only .2 per cent, but in the private schools it was 5.13 per cent; and in New York the figures are .98 and 4.12 per cent respectively. But these percentages alone might be very misleading, since they are computed on different quantities. The actual statistics show that Vermont lost from her public-school enrolment in the year, 265 pupils, and gained in her private schools 259. In Connecticut the gains were 255 and 778 respectively; and in New York, 10,045 and 5,268. Some startling conclusions might be drawn from a superficial consideration of these figures as to the tendency of public opinion as to the relative value of public and private schools; but no confidence could be placed in them, owing to the absence of so many necessary elements of the problem. At the same time it is very desirable that the statistics of the private schools of the country should be collected with the utmost completeness and accuracy, and it is encouraging that Connecticut has already taken legislative action that should secure a complete system of private-school reports in the future, and that movements in the same direction are on foot in several other States.

REPORTS RECEIVED in Washington from Callao describe the sudden collapse of the paper money of Peru. Part of this currency, amounting to 20,000,000 soles, was issued by the banks at Lima ten years ago, and guaranteed by the government. The remaining 40,000,000 soles is government money. Its purchasing capacity declined several years ago to one-twentieth of that of silver, but, in the absence of any other circulating medium, it continued to be used by the people. Finally, in the brief period of ten days, confidence was lost in it so rapidly that it was virtually repudiated in all business transactions not directly connected with the government, which receives it in half payment for duties on imports, and pays it out to its employees. The amount of silver in circulation in Peru is very small. The banks and commercial houses of Lima and Callao could not produce 2,000,000 soles. The experience of Peru is but a repetition of that of every other country that has violated the scientific law in establishing as a circulating medium an article that has no exchangeable value itself, and is not made redeemable in a commodity that has — only more swift and disastrous.

WHEN A WRONG IS ASSAILED in general terms, the assault is apt to be interesting to those who participate in it, and perhaps to those who witness it; but there is some danger that it may not accomplish very much. This truth is illustrated by the results which have so far followed the attempts of various medical journals in this country to abate the evil of quack advertisements in religious newspapers. These attempts have been approved and applauded by medical men, and those who made them knew they

were discharging a useful office. But the religious newspapers have not been cured; and, indeed, they do not seem to have improved materially. One of the reasons for this is, no doubt, the fact that the attack has not been sufficiently sharp on any portion of the line to break it, and that, while the whole religious press bore the brunt of the assault, no one part experienced any special inconvenience from it. The *Medical and Surgical Reporter*, believing that no reform is ever accomplished without somebody being hurt, now states that they shall not hesitate, when next they take this subject up, to lay hands on particular religious papers, and say plainly to the editor of each, "Thou art the man!"

CONVENTION OF AGRICULTURAL CHEMISTS.

THE convention of official agricultural chemists, composed of analytical chemists connected with the United States Agricultural Department, or with state or national agricultural experimental stations or agricultural colleges, or with state or national institutions or bodies charged with the official control of analysis of fertilizers, soils, cattle-foods, dairy-products, and other material connected with agricultural industry, met in the library of the Agricultural Department during the first week of August. About thirty members were present, including two delegates from Canada.

The method of this convention is to distribute samples in advance to all its members, upon the analysis of which they make reports, the object being to secure uniformity of methods and results. Previous to last year, fertilizers only were analyzed. A year ago there were reports on dairy-products, and cattle-foods were added; and this year fermented liquors and sugars. The analyses this year showed, that, following the methods adopted by the association, the older and more experienced official chemists arrived at as uniform results as could be expected, — entirely satisfactory ones, — but that there was great room for improvement among others. Following the same methods, some of the chemists reach very widely differing results.

One encouraging fact was mentioned by the secretary, and that was the very general recognition which the association is receiving from the manufacturers of, dealers in, and users of fertilizers. This has been shown by the great demand for the bulletin of the association, the edition of which for last year was exhausted several months ago, with the call for it still continuing, and by the numerous letters received by the secretary, expressing a desire, on the part of all those interested in the manufacture, sale, or use of fertilizers, to conform their methods of analysis to those adopted by the association. Those interested in other articles subjected to analysis by the association will probably show the same interest when the extension of its work becomes known.

By a change in the constitution, all members of the association who lose their right to membership by retiring from the positions that entitled them to it, may become honorary members, and exercise all the privileges of membership except the right to hold office and vote. It is believed that this amendment will secure the continued interest and co-operation of those who would otherwise cease all connection with the association.

Another amendment of the constitution places the selection of subjects for discussion, and the distribution of samples, in the hands of a number of 'reporters,' appointed by the president, to each of whom certain topics are assigned. These are to take the place of the committees.

The officers chosen for the ensuing year were, Prof. J. A. Meyers of West Virginia, president; Prof. M. A. Scovell of Kentucky, vice-president; Prof. Clifford Richardson of Washington, secretary; Profs. William Frear of Pennsylvania and H. W. Wiley of Washington, executive committee.

PROCEEDINGS OF THE AMERICAN ASSOCIATION.

THE work accomplished in the various sections of the American Association for the Advancement of Science is very satisfactory if considered as a whole. The number of members attending the meeting was comparatively small; while many leading scientists took part in the discussions, and brought important problems before the sections, thus inducing many of the most able students to co-operate in their solution.

Section B (Physics) did very good work in discussing fully the report of the committee on the teaching of physics. Section A (Mathematics) joined on the first day in these discussions, and did not hold any meeting in its own hall. The report of the committee was made by Prof. T. C. Mendenhall. In substance it is as follows:—

The publication in the English language within a few years, of several excellent text-books of physics and a few laboratory guides of a high order of merit, together with a considerable advance in real scholarship among teachers, makes it possible to use the phrases 'text-book work,' 'lecture-work,' and 'laboratory practice,' with a fair chance of being understood; yet it may be well to remark, that, where the latter is referred to, something very different from mere illustrative experimentation is meant; it being the opinion of the committee that the work in the laboratory should be quantitative rather than qualitative, and always of as high a degree of precision as is possible with the appliances available.

In order to give definiteness to its conclusions, the committee undertook to answer the following questions:—

1. In what grade of the public school should physics-teaching begin? 2. What should be the character of this first instruction, — oral, by text-book, by laboratory methods, etc.? 3. What should be the character of the physics-teaching in the high school, — text-book, laboratory, text-book followed by laboratory, laboratory followed by text-book, or laboratory and text-book combined? 4. What knowledge of physics should be required for admission to college? 5. What should be the minimum course in physics for undergraduate students, and what should be the nature of this course?

The answers are as follows:—

1. In answer to the first question, it is the opinion of the committee that instructions in physics may begin, with profit, in what is generally known as the 'grammar school.' At the same time it is decidedly opposed to any general recommendation that it must begin there or in the primary school. Here, perhaps more than anywhere else, nearly every thing depends upon the teacher. One who has a strong liking for and a good knowledge of physics will be tolerably certain to succeed, while another not thus equipped for the work is equally certain to fail.

2. When taught in the grammar school and by a competent teacher, it should be done mainly by and through illustrative experiments. These may be of the simplest character, involving and exhibiting some of the fundamental principles of science; and they should generally be made by the teacher, the pupils being encouraged to repeat, to vary, and to extend.

3. In any discussion of the character of instruction in physics in the high school, one fact of the utmost importance must not be lost sight of. It is that a large majority of the young people who are educated in the public schools receive their final scholastic training in the high school. Its course of study must be in harmony with this fact, such provision as may be made for those who continue their studies in college or university being merely incidental. It is important that the student should be made acquainted, if only to a limited extent, with the methods of physical investigation, and that he should be able himself to plan and carry out an attack upon some of the simpler problems of the science. It is believed that the two very desirable ends can be reached without giving an undue share of the time and energy of the pupil to the subject. Assuming the high-school course to consist of four years of three terms each, it is recommended that the study of physics should begin not earlier than the third year; that it should continue through one year, three hours a week being devoted to it, not including the time necessary for the preparation of the lesson; and that during the first two terms the work should be text-book work, accompanied by illustrative experiments performed by the instructor, and

made as complete as his facilities will allow, while the last term should be devoted to simple laboratory exercises.

4. As to the requirements in physics for admission to college, it is sufficient to say that the course indicated above should be required for admission to any and all courses in the college.

5. In reference to the minimum course in physics for undergraduate students in the college, it seems important to avoid the mistake of asking too much. In many institutions, and especially where the elective system largely prevails, it is possible at present for students to receive a degree and yet be almost absolutely ignorant of the principles of physics. It is the judgment of the committee that a knowledge of this subject constitutes one of the necessary and essential elements of a liberal education, and a minimum course of three hours per week for one year is recommended. What is usually known as the junior year is most desirable for this work, as at that time the student is sufficiently mature and has acquired the necessary training in mathematics to enable him to make the best of what he does. It is recommended that this course consist entirely of text-book and recitation work, with lectures fully and completely illustrated on the professor's table.

The report is signed by T. C. Mendenhall, William A. Anthony, H. S. Corbait, and F. H. Smith.

The very large attendance of members at the session when the report was read, and the continued discussions, show that the importance of the question at issue is well appreciated. The last day of the meeting was exclusively devoted to this subject. The report was very favorably received and unanimously indorsed. It was the opinion of the section that there should be a wide distribution of the report in the educational journals of the country.

The Physical Section did a considerable amount of valuable work besides that of the committee. On the first day W. LeConte Stevens read a very interesting paper on 'The Quality of Musical Sounds.' It contained a sketch giving the method adopted by Helmholtz in his investigation on musical quality, which resulted in the conclusion that "differences in musical quality of tone depend solely on the presence and strength of partial tones, and in no respect on the differences of phase under which these partial tones enter into composition."

In a paper on the 'Beats of Imperfect Harmonies,' read in 1878 before the Royal Society of Edinburgh, Sir William Thomson expressed conclusions inconsistent with those previously reached by Helmholtz, and the question was subsequently studied by means of the wave siren, invented by Rudolph Koenig of Paris, for the purpose of testing the effect of change of phase in quality of tone. This instrument was brought to America a few years ago, but was injured in transit so that it could not be operated. It has since been further improved. Mr. Stevens has had an opportunity to test its action in company with M. Koenig, and believes that through the instrument the truth has been established that variation in phase among the components of a composed sound is a distinct element in determining musical quality.

Dr. E. P. Howland described the most recent methods of instantaneous photography, and during his lecture showed a very interesting specimen of such work, — the photograph of a mule whose head had just been blown off with dynamite. It was taken before the animal fell. The paper was illustrated by experiments and projections.

E. L. Nichols and W. S. Franklin reported on some of their recent experiments on the direction and velocity of the electric current. A coil of wire of 390 turns was driven at a very high rate of speed, the axis of the coil being the axis of rotation. When the coil reached 338 revolutions per second, the linear velocity of the wire in the direction of its own length amounted to 8,000 centimetres per second. By means of two brush contacts at the axis, a current was sent through the coil while the latter was in motion. The magnetic moment of the coil was determined by means of a very sensitive astatic pair of magnets carrying a mirror.

Readings were taken with the coil at rest and in revolution, the motion of the coil and the direction of the current being repeatedly reversed. If the electric current result from the flow of a fluid through the wire, in other words, if it may be considered as possessing direction and finite velocity, the influence of a motion of the conductor with or against the current should produce an appre-

ciable influence upon the deflection of the magnet-needle, even though the velocity of the current were very large as compared with that of the conductor. In order to render the detection of this presumably very small effect less difficult, the direct influence of the coil was eliminated by differential winding. Under these circumstances, when the coil was carrying as large a current as it could be made to do without injurious heating, the rotation of the coil was found to be without appreciable effect upon the magnetic moment of the same. The best results were obtained by sending 4.6 amperes of alternating current of 40,000 alternations per minute through the coil.

At a velocity of the wire equal to 8,000 centimetres per second, they produced no effect upon the needle amounting to 0.2 millimetre deflection. The figure of merit of the coil and needle was determined by substituting a coil of continuous winding, its position with respect to the needle being the same as that of the rotating coil, and determining the current necessary to produce one centimetre deflection. The sensitiveness of the apparatus was found to be such that a current having direction and a velocity of 1,000,000,000 metres per second would have shown a change in its action upon the needle (when the motion of the coil was 380 revolutions, 8,000 centimetres per second) amounting to 0.1 centimetre deflection, — an effect which could not have escaped observation. It follows from the above negative result, that, if the electric current consists in the flow of a medium or fluid through the conductor, the velocity of the same must be greater than the exceedingly high rate just mentioned. Foppl, who in some recent experiments used an apparatus in most essential particulars similar to their own, but one by means of which only relatively very low velocities could have been detected, has reached the same negative conclusion.

Monday was almost exclusively devoted to electrical matters, while only few papers on the subject were read on the preceding days. While the interest of the section was concentrated in theoretical questions, a few problems of practical import were discussed. A new form of electro-magnetic telephone was described by R. B. Fulton, and the efficiency of incandescent lamps was treated by E. Merritt. Messrs. E. L. Nichols and W. S. Franklin gave the interesting results of their spectro-photometric comparison of sources of artificial illumination, which have an eminently practical bearing. C. J. H. Woodbury discussed the protection of watches against magnetism, — a problem that has become of importance since the increased use of electricity for industrial purposes.

The programme of the Mathematical Section embraced many problems of geophysics and astronomy, as well as discussions on the theory of physical instruments. Among twenty-one papers read, six were purely mathematical, while the greater number of the rest referred to astronomy. One of the most interesting of the latter class was Prof. A. Hall's paper on 'The Appearance of Mars in June, 1888.' It will be remembered that recently remarkable changes in its surface were observed which it is difficult to account for. Professor Hall has recently paid considerable attention to this subject, and has observed the planet on eighteen nights, from June 1 to July 2 inclusive.

While observing satellites in April, attempts were made on several nights to see the canals of Mars, but without success; and Professor Hall determined to make the trial in twilight, when he had been able to see more detail on the surface of planets. However, he was not able to see any thing like the regular canals drawn by European observers, although the usual reddish and dark spots and markings were visible nearly every night. The only remarkable change which he noticed during June was the diminution in the size of the white spot at the south pole of the planet. On June 1 the spots at the poles were a good deal extended, but on July 2 the one at the south pole had become very small and round.

The color and brightness of the sky, and the methods of exact measurements, were treated in the Mathematical and Physical Sections. While in the latter Prof. F. P. Whitman reported on certain photographic experiments, in the former Henry M. Parkhurst of New York City read a paper upon 'The Effect of the Brightness of the Sky in extinguishing the Light of Stars' with special reference to photometric observations with a wedge of neutral-tint glass. The presence of moonlight, of twilight, and even of ordinary starlight,

diminishes the effect of the wedge according to the aperture of the telescope and the magnifying-power employed. By observations during the day he had ascertained that the effect of the wedge in extinguishing stars was reduced to less than one-tenth what it was in the evening. He also presented formulæ by which the effective value of the wedge can be ascertained under different degrees of illumination.

In the Chemical Section a report of the committee on water-analysis was read, from which we learn, that, so far, the propositions of the committee have not met with much encouragement in England. The question of water and water-supply was treated by Albert W. Smith with special reference to Cleveland and the water of Lake Erie, while E. H. S. Bailey spoke on the significance of the presence of ammonia in water. Prof. Frank H. Morgan of Cornell University also discussed the progress in chemical methods of water-analysis, and gave a preliminary notice upon iodine as a reagent in the analysis of drinking-water. The last day of the meeting was devoted to the presentation and discussion of laboratory methods.

On account of the absence of the vice-president, Prof. C. M. Woodward of St. Louis, Section D (Mechanical Science) did not organize until the second day of the meeting, and work was not begun until the third day. Lieutenant Peary's paper, on 'Surveys for the Nicaragua Canal,' is mentioned below. In connection with this may be mentioned W. Nelson's paper on 'The Panama Canal,' which was illustrated by stereopticon views. As these subjects are pretty well kept before the eyes of the public, we refrain from a detailed report on the papers.

Considerable interest was excited by W. J. Keep's, C. F. Mabery's, and L. D. Vorce's statement on the influence of aluminium upon cast iron, in which it was shown that the addition of aluminium materially increases the strength of iron, that it causes the carbon to be changed from the combined to the graphitic state, and secures many other advantages.

If we turn to the proceedings of Section E (Geology and Geography, or, more properly Geology, as no geographical papers were read), we find ourselves somewhat embarrassed by the great number of valuable papers that were presented, and by the important facts and theories contained in many of them. We can therefore do no more than point out a few of the most important features of these lectures. Geologists from numerous States were present; but, Cleveland being situated on the Great Lakes, the theory of their origin and the glacial period in general chiefly attracted the attention of the meeting. This was principally the case on Friday, when J. W. Spencer read his interesting series of papers on 'Lake Warren and its Later History.'

Lake Warren is the first chapter in the history of the Great Lakes, and is subsequent to the deposit of the upper bowlder clay, and therefore the lakes are all very new in point of geological time. By the movements of the warpings of the earth's crust, as shown in the beaches, — after the deposit of the later bowlder clay, — the lake region was reduced to sea-level, and there were no Canadian highlands northward of the Great Lakes. Upon the subsequent elevations of the continent, beaches were made around the rising islands. With the rising of the land, barriers were brought up about this lake region, producing Lake Warren, — a name given to the sheet of water covering the basin of all the Great Lakes. A succession of beaches of this lake have been partially worked out in Canada, Michigan, Ohio, Pennsylvania, and New York, covering almost thousands of miles. Everywhere the differential uplift has increased from almost zero about the western end of the Erie basin, to three, five, and in the higher beaches to from five to nine, feet per mile. With the successive elevations of the land, this lake became dismembered, and the present lakes had their birth. The idea that these beaches in Ohio and Michigan were held in by glacial dams to the northward is disproven by the occurrence of open water and beaches to the north, which belong to the same series, and by the fact that outlets existed where placid dams are required.

With the continental rise described above, owing to the land rising more rapidly to the north-east, Lake Warren became dismembered, and Huron, Michigan, and Superior formed one lake; the Erie really was lifted out of the bed of Lake Warren, and be-

came drained; and Ontario remained at a lower level. The outlet of this lake was south-east of Georgian Bay by way of the Trent valley into Lake Ontario at about sixty miles west of the present outlet of this lake. The waters of this upper lake were twenty-six feet over this outlet into the Trent valley, and long continued to flow through a channel from one to two miles wide; and it has cut across a drift ridge to a depth of five hundred feet, as the whole area has been rising. With the continued continental uplift to the north-east (which has raised the old beach at the outlet about three hundred feet above the present surface of Lake Huron), the waters were backed southward, and overflowed into the Michigan basin and into the Erie, thus making the Erie outlet of the upper lakes to be of recent date. This is proven by the fact that the Georgian beach, which marked the old surface plain of the upper great lake, descends to the present water-level at the southern end of Lake Huron, and is beneath the surface of the water upon its north-western side, as the uplift, which has been measured, was to the north-east.

The Erie basin is very shallow, and, upon the dismemberment of Lake Warren, was drained by the newly constructed Niagara River. Subsequently the north-eastward warping eventually lifted up the rocky outlet, and formed Erie into a lake in recent times, thus making it the youngest of all the lakes.

Previous investigations have shown that there was a former river draining the Erie basin, and flowing into the extreme western end of Lake Ontario, and thence to the east of Oswego, but no further traceable, as the lake-bottom rose to the north-east. Upon the southern side there were a series of escarpments, some of which are now submerged. By recent studies of the elevated beaches, it is demonstrated that the disappearance of this valley is due to subsequent warpings of the earth's crust, and that the valley of the St. Lawrence was one with that of Lake Ontario. Recent discoveries show that the ancient St. Lawrence, during the period of high continental elevation, rose in Lake Michigan, flowed across Lake Huron and down Georgian Bay, and a drift filled the channel to Lake Ontario, thence by the present water to the sea, receiving on its way the ancient drainage of the Erie basin and other valleys.

The Huron and Ontario basins are thus sections of the former great St. Lawrence valley, which was bounded, especially upon the southern side, by high and precipitous escarpments, some of which are submerged. But upon their northern sides there are also lesser vertical escarpments, now submerged, with walls facing the old valley. The valley was excavated when the continent was at high altitude, for the eastern portion stood at least two hundred feet higher than at present, as shown by the channels in the lower St. Lawrence, in Hudson Strait, and in the New York and Chesapeake Bays. The valley was obstructed in part by drift, and in part by a north and north-eastward differential elevation of the earth's surface, due to internal movements. The measurable amount of warping defied investigation until recently, but now it is measured by the amount of uplift of beaches and sea-cliffs. Only one other explanation of the origin of the basins has been given,—the "erosion by glaciers." The foundation of this theory is that the glaciers are considered (by some) to erode. A theory of this kind was a necessity, so long as the terrestrial warping was not known.

Living glaciers, however, abrade but do not erode hard rocks; and both modern and extinct glaciers are known to have flowed over even loose morasses and gravels. Again, even although glaciers were capable of great ploughing action, they did not affect the lake valleys, as the glaciation of the surface rocks shows the movement to have been at angles (from 15° to 90°) to the direction of the side of the vertical escarpments against which the movement occurred; also the vertical faces of the escarpments are not smoothed off as are the faces of Alpine valleys, down which glaciers have passed. Lastly, the warping of the earth's surface in the lake region since the beach episode after the deposit of the drift proper is sufficient to account for all rocky barriers which may obstruct the basins.

These papers were followed by an interesting discussion, in which many prominent geologists took part.

A considerable number of papers treated of phenomena similar to those referred to in Mr. Spencer's papers, particular attention being paid to the study of ancient river-beds. A study of wide

scope was A. Winchell's report on systematic results of a field-study of the archæan rocks of the North-west. It is not yet agreed what main divisions of the archæan should be recognized, nor whether any divisions exist in nature. The author's study in the region north-west of Lake Superior showed that this region is peculiarly adapted to the working-out of the order of succession of the various formations. He discovered certain stratigraphic discordances which indicate that the archaic rocks embrace three geological systems, which he designates as the equivalent to the Huronian, the Marquettian, and the equivalent to the Laurentian.

Prof. J. S. Newberry reported on the oil-field of Colorado, while E. Orton described recently discovered sources of oil and gas in Ohio, Indiana, and Kentucky. We merely mention the interesting paleontological papers by Professors Newberry and Ward.

Mr. J. T. B. Ives exhibited one of his interesting geological maps in the section, which consists of a series of colored pasteboards, each representing a geological system. The most recent rocks form the highest layer. Wherever they do not exist, the pasteboard is cut out; and the deeper layers, which represent the more ancient formations, are exposed to view, as they are on the earth's surface. By this effective system the distribution of rocks is very clearly shown. The only objection to such a map is, that those regions which are highest in nature appear to be lowest on the map.

We turn with some reluctance from the proceedings of this section, as so much that is of more than passing interest remains that has not been mentioned in these brief remarks.

While the meetings of Section F were not as good as in recent years, those of the Section of Anthropology showed a marked advance; the number of papers handed in being more than sufficient to secure a full programme, and their value being almost without exception very high. The culminating point of the meetings of this section was the discussion following Dr. Brinton's paper on 'The Alleged Mongolian Affinities of the American Race,' in which Major J. W. Powell, Prof. Horatio Hale, Prof. Otis T. Mason, and Prof. Frank Baker took part. Dr. Brinton gave a terse review of the arguments advanced in favor of the theory of the unity of the American and Mongolian races, and tried to refute them one by one. The discussion turned very soon to the question of races and the principles of classification. Major Powell upheld his frequently expressed views, that language is the only means of classifying peoples, although it also is imperfect. He rejected altogether any division founded on physical characteristics found in the relative proportions and in the peculiarities of the parts of the body, on the ground that every attempt in this line has failed. Prof. Horatio Hale agreed with Major Powell in that respect, that he also considered language the fundamental principle of classification. After Frank Baker had defended the methods based on the physical characteristics of peoples, Otis T. Mason was the first to make the discussion clearer by separating the points of view, which had so far been treated promiscuously,—the linguistic and the genealogical standpoints, or, as Dr. Brinton formulated it later on, the historical and genealogical standpoints. While the study of the former is well advanced in North America, the importance of the latter has hardly yet been fully recognized. The interesting discussion, the salient features of which we have here recorded, will, it is hoped, lead to an increased interest in the study of the physical characteristics of the American race.

Dr. Brinton read two papers more, which were as suggestive, and excited as much interest, as the former. He reported on 'Early Man in Spain,' and availed himself of this opportunity to throw open to discussion the question of an early North Atlantic connection between Europe and America, which was taken up by Thomas Wilson. The second paper was on 'Traits of Primitive Speech,' in which the author maintained that interchanging phonetic elements is a characteristic of such languages, and in which he concurred with C. Abel's theory of a root having the meaning of a certain idea, and of its negation at the same time. Unfortunately the limited time at the disposal of the section did not permit this suggestive paper to be adequately discussed. The basis of the inquiry was one that ought to be kept in mind by all philologists. He maintained that when inquiring into the origin of language we ought to know whether there is any language that can claim to be

more primitive than another, and thus he was led to the question, 'What are the characteristics of primitive language?' His conclusions may or may not be correct. It is of great importance to have emphasized the necessity of solving this preliminary question.

Another fundamental problem was brought before the section by Horatio Hale. Since the European origin of the Aryan race has been maintained by many authors, the champions of the old doctrine of their Asiatic origin have taken a firm stand, and looked for new arguments to defend their position. Max Müller's 'Biographies of Words' was written for this purpose, and Professor Hale seconded his friend in his paper 'The Aryan Race, its Origin and Character.' His main argument is that the race must have sprung from one household, that, according to his theory of the origin of language, must have lived in a favorable climate. Its language was originally complex and highly inflected, but in course of time, by mixture of races, became more simple in form. By this mixture he explains the numerous languages and various races of Europe. Next he dwelt upon the character of the original Aryan or his descendants. He believed that the Iranians were pure Aryans, and showed that certain of their traits may be discovered in European races, while others he ascribes to the aborigines they conquered. The paper was listened to with much interest, but did not excite as much discussion as might have been expected.

Horatio Hale's second paper, 'On an International Language,' engrossed at once the attention of the large audience that listened to it. He took up the argument of the American Philosophical Society, and indorsed its action in discussing the value of existing international languages and of the requisites of such a language. He showed the insufficiency of Volapük; and, in consequence of this interesting paper, a motion was brought before the council of the association, and adopted in the concluding meeting, to this effect:—

"Resolved, That, in the event of a congress being convened for considering the subject of an international language for scientific and other purposes, the council be authorized to appoint three members of this association as delegates, with two others as substitutes, to attend, at their own expense, the congress on behalf of the association, it being understood that no decision of the congress shall be binding on the association until it has been accepted in general session."

The committee appointed by the chair consists of Prof. Horatio Hale, Mr. Henshaw, and Professor McFarland.

We will mention in this place that the committee to memorialize Congress for the preservation of archæologic remains upon the public domain made a voluminous report. It was agreed that it would be well if the following remains of early America could be preserved: Chaco Cañon, Cañon De Chelly, Cañon Del Muerto, and Walnut Cañon, the ruin on Fossil Creek, ruins in Mancas Cañon, the round towers situated on the flat valleys of the lower Mancas, and the Cavate Lodges in the cinder cone, about eight miles east of Flagstaff, A.T. The report continues: "Besides these groups of ruins and dwellings, there are isolated remains in the Territories of New Mexico, Arizona, and Utah, numbering over forty, which demand preservation; the pueblos which are not on treaty reservations or grants, and the old Mandan and Arickaree village on the Fort Berthold Indian reservation in Dakota, to be preserved when they cease to be inhabited by the Indians, also certain burial and village sites in Alaska."

The committee in charge of this work—Miss Alice C. Fletcher and Mrs. T. E. Stevenson—have caused a bill to be introduced in Congress providing for a reservation in New Mexico for the purpose of archæologic study.

The important question of paleolithic man in America, which C. C. Abbott had made the subject of his vice-presidential address, was ably treated by Thomas Wilson, who is so thoroughly acquainted with the paleolithic age of Europe and America.

Attractive features of the meetings of this section were Prof. F. W. Putnam's illustrated paper on the 'Serpent Mound,' and the work done there during the last year; Prof. Otis T. Mason's lecture on 'Woman's Share in Primitive Industry,' which was also illustrated by lantern projections; and Col. G. Mallery's report on 'Algonkin Pictographs.' Professor Putnam's energetic action in preserving the Serpent Mound has roused the citizens of Ohio out of

their inactivity, and a short time since a committee of ladies has been formed in Cleveland to preserve the interesting remains on Fort Hill. Referring to this matter, the following resolution was passed by the association:—

"Resolved, That we heartily commend the effort of the ladies of the Western Reserve to secure Fort Hill to the people of Ohio; that we appreciate highly the importance of preserving to all time, in perfect condition, one of the wonderful remains of antiquity so fast disappearing, and recommend to the citizens of Ohio the work already begun at the Serpent Mound in that State by the citizens of Massachusetts."

Professor Mason tried to show that there are two branches of civilization, one belonging to each sex,—hunting and procuring food, that of man; arts and industries, that of woman. In a very instructive way he traced the influence of the latter in all branches of life. Colonel Mallery's former work in the line of the study of pictographs has won him so well-deserved renown, that all his communications bearing upon this subject are listened to with the greatest interest, as they must form the basis of all studies on the development of the art of writing.

Among ethnological and archæological subjects which were brought before the meeting of the society, we will mention the important finds of paleolithic implements by Hilborne T. Cresson; the interesting exhibit of a gold ornament from Columbia, and a jadeite tablet from Guatemala, by George F. Kunz; and Stephen D. Peet's papers, in which he once more recapitulated his views on the archæology of America.

In the Section of Biology the theory of evolution occupied a prominent place. The number of leading biologists present was, however, not very large, and consequently the meetings of the section came to an end on Monday. Dr. E. L. Sturtevant read a paper which dealt principally with the limitations of evolution as influenced by human control. He demonstrated, in the case of the dandelion, the variability of the wild species and the practical identity between the wild forms and cultivated varieties. Prof. N. L. Britton called the attention of the section to the discrepancies in biological nomenclature, and urged a method to secure uniformity.

The paper of Thomas Meehan, on 'Adaptation in the Honeysuckle and Insect Visitor,' excited considerable discussion among the members of the section. The views of the author on the dependence of cross-fertilization upon the adaptation of the plant to the insect were not shared generally by the other speakers.

Mr. Burrill contended that the general fact of mutual adaptation was thoroughly established, and that the adaptation to other insects than the honey-bee in the honeysuckle might exist. Creative design or evolutionary development might form a point of discussion.

It was doubted by Professor Riley whether observations upon plants outside of their native habitat could be adduced for proving or disproving the existence of adaptations between plants and insects, the latter likely existing only in the native habitat of the plant.

The botany of Michigan was the subject of several papers by W. J. Beal, who gave a report on very interesting observations on the succession of forests in northern Michigan, and compared the flora of the east and west sides of that State, showing that the west side contained plants of more southern distribution, while the east side showed many northern plants not found on the west side.

The Botanical Club met formally on Wednesday morning, Judge David F. Day presiding, and the Rev. W. M. Beauchamp acting as secretary in Prof. V. Spaulding's absence. Judge Day's address included a memorial of the lamented Asa Gray, and a committee was appointed to draft resolutions on this. Steps were also taken for preserving and publishing the proceedings. It was found inexpedient to change the club into a section. On Friday the following resolutions on Prof. Asa Gray were adopted by a rising vote:—

"Resolved, That the Botanical Club of the American Association for the Advancement of Science sincerely regrets, that, meeting but once a year, it should be among the last of similar associations to place on record its sense of the great loss which the whole range of science suffers by the death of Prof. Asa Gray.

"Resolved, That, though among the last to contribute to the wreath of sorrow with which science is everywhere crowning the memory of Dr. Gray, this body takes a mournful pride in remembering that he was one of its honored members, and that it was as

a botanist he won such eminent renown. We feel that we have a right to be among the chief mourners at his departure from the field of labor he loved so well, and in a special degree to unite in sympathy with the many thousands who miss him everywhere.

"Resolved, That copies of these resolutions be forwarded to the family of our deceased friend, and given to the botanical and other scientific serials for publication."

Mr. S. M. Tracy read an interesting paper by Prof. George Vasey, which was finely illustrated by lantern-slides of the vegetation of the great American desert. A pleasant botanical excursion occupied the afternoon.

Prof. T. J. Burrill of Champaign, Ill., was elected president for the next meeting; B. D. Holsted of Ames, Io., vice-president; and D. H. Campbell of Detroit, Mich., secretary.

The report of the committee on the Botanical Exchange Club was accepted, with the thanks of the club for the valuable work accomplished.

The papers throughout the sessions were both valuable and interesting. Prof. J. F. James presented specimens of remarkable variations in *Dentoria multifida* and *Asclepias tuberosa*. Prof. F. L. Scribner's 'Observations on Nomenclature' brought up the question of who shall have credit for a name. Prof. B. E. Fernow's subject, 'What is a Tree?' called forth lively discussion. The question has come to be of considerable importance to the United States Land Office. Rev. Dr. Beauchamp's paper on 'The Names given to Some Plants by the Onondagas,' was listened to with great interest.

The first paper in the Section for Economic Science was read by B. E. Fernow, and treated of the necessity of a forest administration in the United States, in which he called attention to the vast extent of American forests and the wasteful practices by which this valuable property is being destroyed. He estimated the annual loss to the amount of from ten to twenty million dollars. These forests are situated mainly on the western mountain-ranges, which supply the surrounding semi-arid plains with water for irrigation, necessary for the agricultural development of the soil. The equalizing influence of the forest-cover upon waterflow makes their preservation as continuous forests an absolute necessity. Mr. Fernow recommended that an administrative bureau be formed which should have exclusive charge of the timber-lands of the government. Mrs. Laura Talbot of Washington distinguished herself by bringing the subject of industrial education, which has lately excited so much interest, to the attention of the section. Her paper was a vigorous plea for the establishment of industrial schools for children who are now placed in public orphan-asylums and reformatory institutions. Mrs. Talbot denounced the present system of caring for the waifs of the great cities of the country, asserting that it was educating these unfortunates to idleness and crime. She favored manual training in connection with these industrial institutions, as well as farming in all its branches. In the discussion that followed, a number of well-known educators took part, who expressed themselves in favor of manual training in connection with these schools.

Professor Atkinson's valuable paper on 'The Use and Abuse of Statistics' elicited a spirited reply from Col. E. Daniels on the question of currency on which Atkinson had touched, maintaining that a strictly metallic currency would greatly benefit the country. Daniels, on the other hand, said that coined legal-tender money, whatever its material, is of precisely the same purchasing-power, whether of paper, gold, or silver. It will pay precisely the same amount of debt. Coins are nothing else than tools of exchange. They vary in price or exchangeable value according to the number of them offered in the market. Daniels set forth his favorite views more fully on another day, when reading a paper on 'Our Monetary System.'

Discussion in the same line followed Edward N. Ammidown's paper, 'Suggestions for Legislation on the Currency.' He summarized his views in the demand that financial legislation in the United States should aim to increase the use for gold and silver money throughout the country, and to expand its volume in proportion to the growth of population and business. It should encourage the free issue of national bank currency under similar rules which now prevail to secure the easy and rapid expansion and contraction in

harmony with the fluctuating requirements of trade. Such a policy would give the country a broad, substantial basis of metallic legal tender, and, through the national bank currency, furnish the means to maintain easily that equilibrium between demand and supply of money which is essential to continuous national prosperity.

The question of gold and silver was also the subject of a paper by S. Dana Horton, which was read on Monday, in which he considered the opinion established that parity of metals can be maintained by concurrent laws of nations. The question is only a political one whether the European nations will pass these laws.

E. Atkinson's paper, which was mentioned above, covered a wide range of facts. He dwelt upon the abuse of statistics in the separate comparisons of rates of wages and prices of goods, and emphasized the necessity of careful training in this branch of science in order to avoid false deductions and conclusions. His prime object was to show, that, unless statistics are made use of as a basis of economic reasoning by persons competently trained, they become a mere snare and pitfall, working more harm than good through the false deductions that may be made from them; while, on the other hand, the economist who attempts to reason on the condition of men in their relation to each other without regard to the statistics of prices, wages, volume of currency, and other elements by which the exchange of services is contrasted or measured, will, of necessity, be a mere theorist whose unsustained hypotheses may not come near the mark.

On the following day W. O. Atwater subjected the doctrine of Malthus, and his views on the food-supply of the future, to a critical study, and found that the prospects for a greatly increased supply by the use of the discoveries of modern science are very hopeful, and that we do not need to fear the ultimate starvation of mankind. Mr. Charles S. Hill, in his paper on 'Ship-Building and Shipping,' reviewed the history of the decline of American shipping. He vigorously denounced the action of Congress in withdrawing that national aid from American shipping which enabled it to compete with the British. He demanded that ship-building and shipping should be revived in this country by all possible means, and showed how many industries and trades would thus receive a new impulse. The most important paper of this day was a report on the progress made in the work of surveying the Nicaragua Canal route. It will be remembered that at the New York meeting a general sketch of the work done up to that date was given, and the Nicaragua Canal Association did not lose its opportunity at the present meeting of again calling the attention of the public to its enterprise. A photographic reproduction of a bird's-eye view of Nicaragua, and a map (on Mercator's projection) showing the routes around Cape Horn and through the projected canal, were exhibited. Commander Taylor's general report on this subject went materially over the same ground as many of his former lectures on the same subject, but he added a report of the proceedings of the association during the past year. He stated that the contract of 1887 with the republic of Nicaragua had been supplemented recently by one of similar tenor with Costa Rica, perfecting the exclusive title of the Canal Association. A bill to incorporate the Maritime Canal Company of Nicaragua has passed the United States Senate, and now awaits action by the House of Representatives, having been favorably reported by its committee on commerce, with the expression of the committee's full satisfaction as to the financial standing of the Canal Association. Next, Lieut. R. S. Peary gave a sketch of the history of surveys, and of the work done during the present spring. The methods of work were as follows: The expedition being divided into parties and the work into sections, the locations of 1880 in the western division, and of 1872-73 and 1885 in the eastern, were taken as bases, and a main transit and level line run, and bench-marks established about every thousand or two thousand feet. These benches were then checked. From this transit-line, compass, chain, and aneroid offsets were run from one thousand to two thousand feet on both sides; adjacent streams, valleys, and hills reconnoitred; and the work plotted. With this chart in hand, the entire line was then gone over in the field by the engineer in charge, accompanied by the chief of the section, and the location decided upon. The location was then run in and levelled, checking upon the benches of the preliminary line, and cross-sections run and levelled from one hundred to four hundred feet apart, along the

main line, as the topography demanded. Sometimes portions of this location were modified and re-run. Streams were then surveyed and gauged, neighboring elevations beyond the limits of the canal taken with the aneroid, and the entire work plotted on a four-hundred-foot scale with a ten-foot contour. The boring party then went over the line, boring on all summits and in all depressions, and penetrating to the level of the canal-bottom unless rock was encountered sooner. Borings were also made on the sites of all locks, dams, and embankments.

Two perfectly practicable routes of about equal cost were found, either of which is far superior to any other route across the isthmus; and when the day comes, as it surely will, when one canal cannot accommodate the traffic seeking it, then the other can be built, and give one canal for eastward and one for westward bound vessels. The computations of the notes of the surveys being yet incomplete, precise quantities and estimates cannot now be given. In general terms the quantities in the sections where no modifications are made will be the same as those of 1885, while the saving from modifications will be from ten million to fifteen million dollars. The item of earth excavation, with its varied plant of excavators, cars, locomotives, etc., and its attendant expense of maintaining and shifting tracks and handling material in rainy weather, is reduced to a minimum, and the construction of the canal provided for practically under the three heads of hydraulic mining, rock-excavation, and dredging, all independent of drainage and rains. The work can be prosecuted day and night without interruption. Numerous borings have made an end of the bottomless swamps, semi-liquid quicksands, and numerous other subterranean bug-bears which have been conjured up against this route, and have shown that in no portion of either line is there any trouble about foundations. In the worst swamps the boring implement, after sinking with its own weight perhaps ten or at most fifteen feet, reached a stratum of firm red clay extending to bed-rock. The experience of the expedition is worth volumes as evidence concerning the effects of the climate of Nicaragua. During the seven months it was in the field, not a man out of nearly two hundred was lost, and there was not a single case of serious illness. The size and capacity of the canal will not vary materially from the plans of 1885. The number of locks will be reduced to six, and possibly five, and the time of lockage to thirty minutes. The general dimensions and methods of construction of the locks are not changed, but the double lock at La Flor is a new feature.

C. K. Remington's plea for cremation was very much contested by various members of the section. The paper was illustrated with diagrams on the blackboard, and the process of incinerating a body was fully explained. The description of the construction of a crematory was especially interesting. In answer to questions propounded, Mr. Remington stated that cremation was necessary as a sanitary measure. He also contended that the land used for cemeteries was needed. He thought it much better that a body should be reduced to dust in an hour than for it to lie in the ground for years.

Mr. Henry Farquhar gave, under the title 'Economic Value of Binary Arithmetic,' a paper that was more interesting from a theoretical point of view than from a practical. He explained the advantages that would accrue from the substitution of two for ten as a basis for counting. Instead of having to commit sums of figures to memory, we would perform addition by simply counting the marks of similar shape. There would be no multiplication table to learn, all multiplication being resolved into displacement of symbols on a regular plan. This would bring a considerable degree of arithmetical skill within reach of many who cannot possibly attain it at present.

On Tuesday J. R. Dodge read an interesting paper on 'The Agricultural Surplus.' He pointed out that the United States have a surplus of agricultural products very large in proportion to the total volume. He considered this fact an element of strength and of weakness, and at the same time a subject of congratulation and regret. "The congratulation," he said, "is found in the ability to relieve the deficiencies of needy nations, while swelling the plethora of domestic wealth: the regret is for the tendency to over-production of certain crops, and its inevitable result. This is the reduction of prices for the benefit of the foreign purchaser, without any advan-

tage to the producer. Very few people know the extent of our net surplus in agriculture. Almost every one exaggerates it." Mr. Dodge continued to show that the value of the exported product at farm prices is less than \$400,000,000. The value of the deficiency supplied by import very nearly reaches \$350,000,000. Thus we have a surplus sufficient to pay for our deficiency, and little more. This is the net result of our boast of feeding the nations. We feed them just a little more than they feed us. The lesson we learn from these facts is, that no nation can afford to have a deficiency of the raw products of agriculture; and, as a rule, nations do not. There is one notable exception, and that is apparent more than real. Great Britain seems to have a large deficiency. Really it is largely made good by shipments from her own colonies, of the dividends of her own capital, under the technical name of 'imports.' Our agriculture, therefore, should seek to supply deficiencies rather than to swell surplus crops; to meet the present wants of domestic markets, and create new wants by a greater variety of edible products, especially the fruits; and afterwards supply any deficiency of foreign nations that is practicable or possible.

Last of all we mention W. F. Switzler's sketch of the history of statistics, in which he showed that at the earliest stages of civilization attempts to ascertain statistical data were made, and in which he traced the gradual development of that science. He dwelt upon the importance of statistics to the statesman, whose art is thus made "to rest on the solid masonry of well attested and accomplished facts, the granite pedestal of recorded history. It is no longer a speculation: it has become a mathematical demonstration. It is no longer a prophecy: it is a revelation." The paper closed with an interesting history of the methods of gathering statistical data.

The meetings of this section were well attended, and there was sufficient material on hand to keep the section busy until the end of the meeting.

EVIDENCES OF THE ANTIQUITY OF MAN IN EASTERN NORTH AMERICA.¹

IN studying the history of man we have to adopt the same methods and draw the same inferences as have been done in tracing the evolution of animals. This, strangely enough, seems repugnant to very many, who feel that any relationship, however remote, with less intelligent creatures, is a reflection upon their own intelligence.

To determine at what precise point in geological time man appeared upon the earth, is, it seems to me, obviously impracticable, from the fact that the dividing-line separating humanity from the non-human cannot be drawn. It were as easy to name the moment when the gloaming merges into night, or shout with confidence, 'Now!' as the dawn brightens into day. Nor is it demonstrable, with our present knowledge, to point to that country where the momentous change first took place, if it occurred but once. At present, however, we can safely say that miocene man is extremely problematical, and pliocene man a question as yet unsettled; the auriferous gravels of California being pronounced late tertiary by Whitney, and by LeConte as representing "the beginning of the glacial epoch."

At all events, we have neolithic man as far back as the glacial epoch, and possibly in the pliocene. Man in the tertiaries, therefore, championed by my honored predecessor, Professor Morse, becomes something more tangible than a hypothetical creature. Professor Putnam has arrived at the conclusion that the western coast of our continent was inhabited by man in earlier geological times than the eastern half.

Mr. Warren Upham has examined the drift formation of Little Falls, Minn., where Miss Babbitt found those extremely rude but unquestionably worked quartzes, and describes it as the flood-plain of a river of the glacial epoch.

In 1883, as the result of exhaustive studies of glacial deposits, from New Jersey westward, across Ohio, Rev. G. Frederick Wright predicted that traces of paleolithic man would be found in the latter State.

¹ Abstract of an address before the Section of Anthropology of the American Association for the Advancement of Science, at Cleveland, O., Aug. 15-22, 1888, by Charles C. Abbott, vice-president of the section.

Paleolithic implements, concerning which there can be no doubt, have not been discovered in abundance as yet, but Professor Wright's belief proves to have been well founded. Dr. C. L. Metz of Madisonville, O., has discovered two specimens which set the matter at rest. Both were found at significant depths, one of them nearly thirty feet below the surface. The region where found is one characterized by immense gravel-deposits of glacial age and origin.

They show that in Ohio, as well as on the Atlantic coast, man was an inhabitant before the close of the glacial period. We can henceforth speak with confidence of interglacial man in Ohio. It is facts like these which give archaeological significance to the present fruitful inquiries concerning the date of the glacial epoch in North America.

Mr. Hilborne T. Cresson has discovered two chipped implements of argillite which he found *in situ*, at a depth of several feet from the surface, in railroad cuttings through the old terrace of the Delaware River near Claymont, Del. The geological position of these specimens will excite discussion, but their great age will not be questioned. Of particular interest, in relation to discoveries in the gravels at Trenton and Ohio, is the discovery of a large flint implement found by Mr. Cresson in the glacial gravel in Jackson County, Ind.

From evidence so far obtained, it seems that on either seaboard paleolithic man lived in great numbers, and that as a coast-dweller he pre-eminently flourished. In the valley of the Delaware River paleolithic man has left such abundant traces of his former presence, in the form of rudely fashioned stone implements, that for long they were considered as the hasty or unfinished work of the later Indians.

As the first to point out what is now maintained by competent archaeologists to be their real significance, I may be pardoned for devoting the conclusion of my address to a consideration of that region, — the Delaware valley, — so far as its physical character and the traces of prehistoric man found there have a bearing on the question of the antiquity of man in America.

The question may now be asked, What is a paleolithic implement? It is not very readily defined, as there is considerable variation in the shape; but, as I understand the significance of the term, it is properly applied to coarsely chipped masses of flinty rock, upon which a distinctly designed cutting edge is formed, to which is often added an acute point. Furthermore, they show unmistakable evidence of antiquity by the weathering of their surfaces; and they are found as a rule, but not necessarily always, in deposits of glacial or river drift with which they agree in age.

How far do these Trentonian implements meet with these requirements?

My own impressions of their true character was not suddenly reached. The evidence of other kind, of the antiquity of the Indian, led me to consider them as rude objects made for some trivial purpose and discarded. Later, I became convinced that they were older than ordinary surface-found relics, and assumed that the Indian of history commenced his career in this valley while in the paleolithic stage of culture.

Thus, while pursuing my collecting of Indian relics, it was gradually forced upon my mind that these rude implements were more intimately associated with the gravel than with the surface of the ground and the relics of the Indians found upon it.

Acting upon this, I continued for two years to examine most carefully both the surface of our fields and every exposure of the underlying gravels; and in June, 1876, after having found several chipped implements *in situ*, expressed the opinion that the Delaware River, "now occupying a comparatively small and shallow channel, once flowed at an elevation of nearly fifty feet above its present level; and it was when such a mighty stream as this, that man first gazed upon its waters, and lost those rude weapons in its swift current, that now, in the beds of gravel which its floods have deposited, are alike the puzzle and delight of the archaeologist. Had these first-comers, like the troglodytes of France, convenient caves to shelter them, doubtless we should have their better wrought implements of bone to tell more surely the story of their ancient sojourn here; but, wanting them, their history is not altogether lost, and in the rude weapons, now deeply embedded in the

river's banks, we learn, at least, the fact of the presence, in the distant past, of an earlier people than the Indian."

Thus it will be seen that I have been fairly cautious in my statements, and slow in reaching any conclusions with reference to these implements which separated them from ordinary Indian relics.

But, admitting that a given class of stone implements is characteristic of a given deposit of gravel (and I think we must admit this now), what is the geological history of this deposit? Is it too recent to be of special import, or too ancient to be of archaeological significance? Both views have been held, and neither proves tenable. That the former view should have found supporters is indeed strange. Certainly there is now no movement of the gravel by the river, whatever its condition or freshet stage; and certainly, if these rude forms were of identical origin with common Indian relics, then rude and elaborate alike — jasper, quartz, porphyry, and slate together; axes, spears, pottery, and ornaments, all of which are found upon the surface — should have gradually become commingled with the gravel, even to great depths. Any disturbance that would bury one would inhere alike the various forms of neolithic implements. Such, however, is not the case.

How old, and not how recent, are the Delaware valley, or, as they are now known, Trenton gravels? This, it is all-important, should be definitely determined. A clear light has been thrown upon these questions by G. F. Wright, who shows that these gravels are the last important result of the glacial epoch, the direct result of the melting of the glaciers, as they retired northward; and that, while this was in progress, the rude implements of paleolithic man were lost and embedded in them.

Admitting this, how long ago did it take place?

If we accept the most moderate estimate of the length of post-glacial time, some six thousand years, we have of interglacial time (i.e., between the first and second epochs) from eighteen thousand to sixty thousand years; and to this, as I understand the matter, must be added the long stretch of time during which the second epoch of cold continued. Assuming, therefore, that geologists have made no mistake, archaeology has time enough and to spare. At no time was the continent uninhabitable, however thick and wide-reaching the ice, or deeply submerged the lower-lying areas. Still there was land enough for mammalian life in all its glory, and it flourished at the very foot of the advancing ice-sheet, and re-entered every tract as the glaciers withdrew. Then we had the mastodon and mammoth, reindeer and bison, musk-ox and moose, and man familiar with them all.

Having made clear, I trust, what is meant by paleolithic man, and shown also that he *was* a fact and *is* not a fancy, the question naturally arises, What was his fate? Did he, like the mastodon, become extinct, or has he descendants still living on this continent? If the paleolithic implements were strictly confined to the gravel-deposits, like fossils in the underlying marl-beds, then, as it seems to me, we would be unable to refer paleolithic man to any branch of the human race now alive; but, as a matter of fact, there is no such break, — no evidence of an hiatus of greater or less duration between paleolithic man and the Indian. The former continued to dwell here until the last pebble of the great gravel-deposit had been laid down, and possibly into the soil-making period, but not now, as paleolithic man. The significant advance to the manufacture of more specialized implements took place; the rude argillite paleolith, the same in form the world over, giving way to spears and other definite forms. The form of the product altered, but the same material, argillite, continued in use. There was no pottery, no polished stone, little if any attempt at ornamentation; still, when we compare these later objects of argillite with the earlier and original patterns, we see what a tremendous forward stride had been made.

Next we have to consider the important fact that the flint implements known as Indian relics belong to the superficial black soil, while at the base of this deposit of soil the argillite implements occur in greatest abundance.

This briefly covers the range of evidence, first, that paleolithic man did not become extinct; second, that his descendants attained to an advanced degree of culture in the land of their forefathers. What, then, was this people's subsequent career? Were it not for the three skulls found in the Trenton gravels, we could still main-

tain that we have their descendants in the Eskimo, and that they were finally driven north, after contact with the Indians, who, as is conceded by all students, migrated hither, at, archæologically considered, a not exceedingly remote period. The Indian traditions assert that they found the region occupied; and for once, at least, we have evidence which confirms tradition.

However others may be impressed by what I have now presented, for myself, as I wander along the pleasant shores of the Delaware River, seeing it but a meagre stream between high banks in mid-summer, or in winter swollen and choked with ice until these are almost hidden, I recall what time this same stream was the mighty channel of glacial floods, pouring seaward from the mountains beyond, and picture the primitive hunter of that ancient time, armed with but a sharpened stone, in quest of unwary game. And later, when the floods had abated and the waters filled but the channel of to-day, I recall that more skilful folk who with spear and knife captured whatsoever creature their needs demanded, — the earlier and later chippers of argillite.

These pass; and the Indian, with his jasper, quartz, copper, and polished stone, looms up as the others fade away. His history, reaching forward almost to the present, I leave in the hands of others to record.

SCIENTIFIC NEWS IN WASHINGTON.

A Great Medical Meeting to be held in Washington. — Interesting to Mariners: a Simple Method of computing a Ship's Course and ascertaining her Distance sailed on the Great Circle between the Point of Departure and the Point of Destination, about to be published by the Hydrographic Office: a Valuable Set of Charts nearly completed. — Terrible Death Rates in India.

The First American Medical Congress.

THE first triennial meeting of the Congress of American Physicians and Surgeons will begin in Washington, Sept. 18, and will continue three days. Three years ago one of the societies constituting the congress conceived the idea of bringing together once in three years representatives of the great medical societies of the country. The plan was presented to all of them, and indorsed by ten. These eleven societies, in accordance with the general plan suggested, each appointed one of their number to constitute an executive committee. The committee met, and decided that an association should be formed with the name given above.

This committee is composed as follows, the names of the societies they represent being appended: C. M. Martin, Mobile, American Surgical Association; John P. Bryson, St. Louis, Genito-Urinary Surgeons; J. Solis Cohen, Philadelphia, American Laryngological Association; A. L. Loomis, New York, American Climatological Association; William Pepper, Philadelphia, Association of American Physicians; William H. Carmalt, New Haven, American Otolological Society; William F. Norris, Philadelphia, American Ophthalmological Society; L. C. Gray, New York, American Neurological Association; J. E. Atkinson, Baltimore, American Dermatological Association; H. P. Bowditch, American Physiological Society; N. M. Shaffer, New York, American Orthopedic Association.

The committee also determined that a meeting should be held in this city once in three years: the September session will therefore be the first. It is also proposed that the several societies constituting the congress shall hold their annual meetings at the same time, each being conducted according to its own special programme. This will make the occasion one of the most important to the medical profession of the United States that has ever occurred. The separate societies will each hold meetings twice a day, while the meeting of the congress will take place on Tuesday, Wednesday, and Thursday evenings.

The topics for discussion at the three meetings of the congress will be as follows; on Tuesday evening, 'Intestinal Obstruction in its Medical and Surgical Relations' (Drs. R. H. Fitz of Boston, and Nicholas Semm of Milwaukee, will open the discussion, and they will be followed by others whom the executive committee may designate); on Wednesday, 'Cerebral Localization in its Practical Relations' (Dr. Charles H. Mills of Philadelphia, and Dr. Roswell Park of Buffalo, will open the discussion, and they will be followed

by Mr. Victor Horsley and Professor Ferrier, of London, Eng.); on Thursday evening the congress will meet in the hall of the National Museum, and Dr. John S. Billings, U.S.A., of Washington, president of the congress, will deliver an address on 'Medical Museums.' At the close of this session a reception will be given in the Army Medical Museum building, to which members and invited guests, their wives and daughters, will be invited.

In addition to the reception on Thursday evening, a complimentary dinner will be given to the guests of the congress by the members, on Monday evening, at Willard's Hotel. Some of these invited guests are as follows: Sir Spencer Wells; Sir Andrew Clark; Sir William McCormac; Drs. W. O. Priestly, William Ord, and Granger Stewart; Mr. Lawson Lait; Mr. Victor Horsley; Mr. Thomas Bryant; Mr. Thomas Annandale; Professors Ferrier, Esmarch, and Gerhardt; Drs. Rafael Lavista of Mexico, J. L. Reverdin of Geneva, O. W. Holmes and H. J. Bowditch of Boston, Joseph Leidy of Philadelphia, W. Kingston and Eccles of Canada.

An informal collation will also be served at Willard's Hotel from ten to twelve o'clock Tuesday evening, to which only members of the congress, and other physicians who may be in the city, will be invited. The following-named gentlemen compose the committee of arrangements for the meeting: Samuel C. Busey (chairman), J. Ford Thompson, R. T. Edes, E. C. Morgan, W. W. Johnston, and S. O. Richey, of Washington; J. E. Atkinson, H. Newell Martin, and Samuel Theobald, of Baltimore; A. Sydney Roberts of Philadelphia; and A. T. Cabot of Boston.

Neither the congress nor the individual societies will transact any business during the meeting. The object of the congress and of the several societies is the consideration of subjects pertaining to medical science. The discussion of medical ethics and kindred topics, even, is excluded. The congress will not even elect officers. Dr. Billings has been chosen by the executive committee to preside, and the presiding officer of the next congress will be selected by one of the societies represented in the congress. The object of the gathering may be more definitely stated to be to consider and discuss professional topics of a scientific nature, and nothing else will be brought to the attention of the members. The expenses of the congress will be paid by the members, whose contributions will all be voluntary. Headquarters for the registration of members will be opened at Willard's Hotel on the Saturday preceding. Dr. Busey expects that there will be an attendance of about five hundred members. Three other medical societies not connected with the congress will hold their annual sessions in Washington at the same time. They are the American Gynecological Society, the American Association of Obstetricians and Gynecologists, and the Pediatric Society.

'Recent Developments in Great-Circle Sailing.'

In view of the increasing recognition among mariners of the sound principle of conducting a ship along the arc of the great circle joining the points of departure and destination, and of the great advantages to be gained by a knowledge of this branch of nautical science, a work bearing the above title has been prepared in the Hydrographic Office, which has for its object the collection into one volume of all the analytical processes, and a description of all charts and devices which have been constructed, for the navigation of the great-circle track. It thus forms a history of the development of methods of great-circle navigation, and reveals the present state of the science, and is also a treatise on the subject, so arranged as to give a clear conception of each method, and to form a directory to sources where more extended information may be found.

The work presents the methods, among others, of Towson, Airy, Chauvenet, Lieutenant Hilleret (French Navy), Commander C. D. Sigsbee, U.S.A., and Mr. Gustave Herrle of the United States Hydrographic Office. The latter method is undoubtedly the simplest yet found for practical use in great-circle sailing.

The simplicity of the methods necessary for navigating the really circuitous track of the Mercator projection, and the long duration of its usage, have so popularized them with seamen, that no method of handling charts dissimilar to them will be received with favor. Another essential consideration in the construction of great-circle sailing-charts is a method that enables one to measure the course and distance, from the actual position of the vessel, independently

of any great-circle track previously laid down, just as the rhumb course and distance are measured on the Mercator chart. These principles were recognized in the construction of the great-circle charts issued by the Hydrographic Office. The maturing of them, and their publication in the form of the present excellent sailing-charts, have been due to that office. They are now issued for the North and South Atlantic Oceans, and Indian Ocean. The plate for the latter was used to reproduce, by electrotyping, plates for the North and South Pacific Oceans. It is expected that this series of sailing-charts will be completed before July 1, 1889. Those already published have been received with great favor, and have undergone severe tests for accuracy and utility; and numerous reports have been received testifying to their usefulness in lessening the labor of computations on the great-circle route.

The general lack of the practical application of the principles of great-circle sailing in the past seems to have resulted, not from the want of recognition of the fact that the shortest distance between any two points on the earth's surface is the arc of the great circle passing through them, nor that the great-circle course is the only true course, but from the tedious operations which have been necessary, and from the want of concise methods for rendering these benefits readily available.

Sanitation in India.

Mr. B. F. Bonham, United States consul-general at Calcutta, has sent to the State Department an abstract of a lecture by Mr. Justice Cunningham, at the Parkes Museum, on 'Sanitation in India,' from which the following interesting extracts are made:—

"The views of the sanitary parties in India might be summarized in the following proportions: that the mortality of the population is vastly in excess of that of civilized countries, and in particular cannot be calculated at less than 10 to 15 per thousand in excess of the English rates, an excess making at least 2,500,000 of deaths and 50,000,000 cases of severe diseases; that this excess, or a large portion of it, is preventable by practical means fairly within human competence; that the existing administrative machinery is powerless to make any impression on this excessive mortality, but that its tendency is rather to intensify it; that there are reforms which materially affect it, which might be adopted without grievance to the people or detriment to the government finances, and that it is the duty of the government to adopt such reforms. As to the excessive mortality, the lecturer pointed out that wherever registration approached completeness there were high ratios of 30 per thousand and more, the central provinces ratio being 34 and the north-western provinces 32; that many large areas with populations of a million and upwards showed ratios of 40 and 50 per thousand, and many towns and municipalities showed ratios of 40, 60, 70, 80, and even higher. Such ratios showed that the laws of health were being contravened on an enormous scale. A curious instance of the extreme prevalence of disease was shown in Calcutta, where, out of a population of 445,000 persons, no less than 325,000 were treated annually in public medical institutions. Coming next to preventability, experience proved, that, wherever effective sanitation was carried out, the ratios of Indian mortality sunk at once to that of England.

"The great mass of Indian mortality was occasioned by epidemic diseases, which are preventable or mitigable, and in England have either disappeared or sunk to insignificant proportions. The Army Sanitary Commission gave what they call a 'deplorable record' of 38,000,000 of victims within a single decade to such diseases. Coming to particular instances, the extraordinary reduction in the mortality of the European army from 69 per thousand to 12 or 14, and the invaliding ratio from 43 to 23, the cholera mortality from 9.24 to 1.17, showed what sanitation could do in the case of men newly exposed to a tropical climate. The reduction of the mortality in jails was equally remarkable: it is now about one-third of the former rate. In Madras the extraordinarily low ratio of 17.80 per thousand had been attained. The high ratio of over 100 per thousand in some Bengal jails pointed to active insanitary conditions of soil, structure, or mismanagement. Another striking instance is that afforded by those parts of Calcutta which have been properly sanitated, which would compare favorably with the best parts of London for healthiness, while the insanitary wards of the city are

scourged with epidemics,—are the perennial home of cholera,—and the suburbs of Calcutta have long been a scandal, not only to the Bengal Government, but to English civilization."

BOOK-REVIEWS.

A Text-Book of Physiology. By JOHN GRAY M'KENDRICK. Including Histology, by Philip Stöhr. In two volumes. Vol. I. General Physiology. New York, Macmillan. 8°. \$4.

THE book before us, which is but the first volume of M'Kendrick's 'Text-Book of Physiology,' is modelled to some extent on his 'Outlines of Physiology,' although it has been so greatly extended in every direction as to make it an entirely new book. This volume treats of the general physiology of the tissues; while the second, not yet published, but in the printer's hands, deals with the special physiology of organs.

In the introductory section the author discusses the nature and objects of physiology, matter and energy, and the general principles of biology, including the organic form and mode of growth, the evolutionary history of living beings, and the theories of life. In the second section the chemistry of the body is treated; the nature and properties of the chemical substances found in the body, and the nature of the chemical re-actions with which the phenomena of life are associated, being considered fully. The true value which should be given to chemical formulæ by the physiological student is specially explained by the author. The chapter on pigments is an exceedingly valuable one, the subject being treated more fully than in any other text-book of physiology.

Dr. M'Kendrick has been especially fortunate in being able to incorporate into his text-book Professor Stöhr's 'Lehrbuch der Histologie,' which, so far as we know, had not, up to this time, been translated. The illustrations of this portion of the work are not diagrams, but drawings of real preparations, and remarkably true to nature.

The closing section treats of the contractile tissues. In it the electrical apparatus employed in the study of muscle is described and illustrated. The author believes, and we think rightly, that the importance of the uses of electricity in practical medicine and surgery justifies him in describing electrical apparatus. We are somewhat surprised to find the statement that "the teacher has usually to deal with students who know little or nothing about physics." We had supposed that the student, before being permitted to begin the study of medicine in the United Kingdom, must be well prepared in physics, and are therefore surprised to hear one who is undoubtedly in a position to know, say that he knows "little or nothing" about it. It appears, however, from our author's preface, that an examination in mechanics is required as a preliminary; but this, he says, is of no use, being just sufficient to worry the student and exhaust his energies, without conferring any real benefit in the shape of a knowledge of the principles of physical science. It is on account of this ignorance on the part of students that certain details as to physics are introduced into this text-book. Taken as a whole, the first volume of Dr. M'Kendrick's book is a most valuable one, and we shall look for the second with great interest. If he succeeds as well in his treatment of special as he has succeeded with general physiology, his text-book will be entitled to a prominent place among the best text-books of physiology.

Electrical Instrument Making for Amateurs. By S. R. BOTTONE. 2d ed. New York, Van Nostrand. \$1.20.

IN the preface to this work Mr. Bottone says, "Nearly all the really useful inventions and discoveries which have rendered the nineteenth century so remarkable as a season of progress must be attributed to amateurs. For this reason, if for no other, we should render every assistance in our power to the *bona fide* amateur." Mr. Bottone's idea of a *bona fide* amateur is difficult to conceive. He would claim a wide meaning for the word if he included Faraday, Maxwell, Joule, Thomson, and Rayleigh, in his own country. Still there is no need of quarrelling about a definition, or of asking by whom the useful work of this century has been done. Mr. Bottone's book is a helpful and a needed one, and has much to com-

mend it. It appeals to 'true amateurs,'—boys who have a scientific turn of mind, and men who have some leisure from their work, but who have not the facilities that a laboratory offers.

The tools required are of the simplest kind, no turning-lathe or expensive apparatus being needed. Most of them are to be found in the ordinary equipment of a householder: the rest may be purchased for a few dollars. The materials, too, are inexpensive and easy to get.

The directions in this book are full and clear, and where it is necessary dimensional drawings are given. When the amateur has built every thing that is described, he will find himself in possession of quite a complete set of apparatus for electrical experiments, — galvanometers, electroscope, condenser, voltmeter, Wimhurst machine, induction-coil, etc.; and, if he compares the cost of them with the catalogue prices, he will have cause to congratulate himself. But the most important thing he has acquired is a skill in manipulation, and a knowledge of the instruments that will enable him to experiment usefully with them.

There are some verbal errors in the book, — we do not usually speak of "8 hours' resistance," for example, — but they do not take away its usefulness. In that part of the appendix, however, that treats of accumulators, there is the serious mistake of confusing discharge-rate with storage-capacity. Page 174 had better be omitted.

Popular Chemistry. By J. DORMAN STEELE. New York, Barnes. 16°.

THIS is the familiar 'Fourteen Weeks in Chemistry,' revised and brought down to date, with some additions in appendices describing methods of manipulation and simple analyses. The object of this successful book was, by bringing out prominently such elementary facts in chemistry as would be likely to interest the average boy or girl, to give the most of them such a smattering of knowledge as would give a key to many of the chemical changes they would be likely to observe in every-day life, and to leave such a pleasant impression with the few as might lead them to further study. The book has served its purpose well in the past, and, in its new form, is likely to have a continued usefulness for some time to come. The revision has been done by competent hands. A useful glossary, giving the pronunciation of chemical terms, is one of the additions. The chapters on organic chemistry have been completely re-arranged and to a great extent re-written.

An Index to Engineering Periodicals, 1883 to 1887 inclusive. By FRANCIS E. GALLOUPE, M.E. Boston, 30 Kilby Street; New York, Eng. News Publ. Co. 294 p. 12°.

THE progress in developing material resources, in recent years, has created a vast amount of engineering literature, which is scattered through the various engineering journals. To render a large amount of this available, has been Mr. Galloupe's task, who has sought, in a handy little volume containing about ten thousand references, to cover the contents of the leading journals during the past five years. The matter seems to be arranged admirably under topics. The book will certainly serve a purpose with all interested.

NOTES AND NEWS.

MR. G. W. LITTLEHALES, assistant in the Hydrographic Office, has completed a monograph on 'Recent Developments in Great Circle Sailing.' Lieutenant Dyer, in charge of the office, who has devoted much time and labor to the study of this subject, will write the preface. — Henry Holt & Co. announce as in preparation, 'Briefer Course in Physics,' by George F. Barker; 'Dissection of the Dog,' as a basis for the study of physiology, by W. H. Howell; 'Brief History of the United States,' by Alexander Johnston, professor in Princeton College (this book is intended to meet the needs of teachers who desire a briefer and more elementary text-book than the author's well-known 'History of the United States'; it is, however, very far from being a condensation of that work); 'Greek Literature,' by Thomas Sergeant Perry; 'Chemistry (Advanced Course),' by Ira Remsen; 'Das Wesentliche der Deutschen Grammatik,' by A. W. Spanhoofd; and 'First Lessons in Political Economy,' by Francis A. Walker. — D. Van Nostrand, New York, announces 'The Elements of Electric Lighting,' by Philip Atkinson, for speedy issue; also 'Modern Reproductive Processes,' being a manual of

instruction in the art of reproducing drawings, engravings, manuscripts, etc., by the action of light, by Mr. Ernst Lietze; a translation of the Russian work of Woeikof on 'The Climates of the Earth,' by Prof. Cleveland Abbe of the Signal Office; a large and important work by Col. George E. Waring, jun., being a general treatise on city, town, and village sewerage and drainage, and land drainage; and 'Plate Girder Construction,' by Isami Hiroi, the latest issue in the Van Nostrand's Science Series. — G. S. Fellows & Co., New York, announce 'Memory Systems, New and Old,' by A. E. Middleton. This is the first American edition from the second English edition, revised and enlarged, with bibliography of mnemonics, 1325–1888, by G. S. Fellows, M.A., of the Washington High School. They also announce 'Protection Echoes from the Capitol,' by Thomas H. McKee, containing twelve hundred aphorisms and leading principles of the protective policy. — Cupples & Hurd have in press a volume on 'Typical New England Elms and Other Trees.' — Harper & Brothers have just ready Walter Besant's 'Fifty Years Ago.' This is an illustrated account of English life, customs, and manners half a century ago, when Queen Victoria ascended her throne. — G. P. Putnam's Sons publish 'The Story of Media, Babylon, and Persia,' including a study of the Zendavesta or religion of Zoroaster from the fall of Nineveh to the Persian war (continued from 'The Story of Assyria'), by Zénaïde A. Ragozin, in their Story of the Nations Series, illustrated with maps and woodcuts; and 'A Sketch of the Germanic Constitution,' from early times to the dissolution of the empire, by Samuel Epes Turner. — Roberts Brothers publish 'Harvard Vespers,' a volume of addresses to Harvard students, by Francis G. Peabody, Phillips Brooks, Edward Everett Hale, Alexander McKenzie, George A. Gordon, and Andrew P. Peabody, delivered during 1886, 1887, and 1888. — James J. Chapman, Washington, D.C., will issue early in September McPherson's 'Hand-book of Politics for 1888.' It will cover the proceedings of the second session of the last Congress (49th), and the first session of the present Congress (50th), and will give the final facts as to every pending public measure. — *Das Centralblatt für Bibliothekswesen* for July contains a remarkable article by J. Gildemeister of Bonn, on the 'Oriental Literature of the Discovery of America,' containing some curious particulars, taken from a Mohammedan work, of the voyage of an Indian ship, which, after driving about in the ocean for eight months, was cast on to the shore of the New World. — For the first time in its history *The Century* will devote a single issue — the forthcoming September number — largely to educational themes. The contributions will include 'The University and the Bible,' by T. T. Munger, a plea for the study of Christian as well as Heathen classics; 'Women Who go to College,' by Arthur Gilman; and 'The Industrial Idea in Education,' by Charles M. Carter. One illustrated paper is on 'College Fraternities,' with pictures of twenty-eight chapter-houses and society-halls at Yale, Harvard, Princeton, and other colleges; and another is on 'Uppingham, an Ancient School worked on Modern Ideas,' with a number of illustrations by Joseph Pennell, and a portrait of the late head master, Edward Thring, who is said to be, since Arnold of Rugby, the most highly esteemed educator of England. There will also be several important short editorial articles and 'open letters' on different branches of the same subject. Other distinctive features of the magazine, the Lincoln history, Siberian papers, fiction, etc., will, however, be retained. — The Washburn and Moen Manufacturing Company of Worcester, Mass., has just published the sixth edition of their 'Pocket Handbook of Copper and Iron Wire in Electric Transmission.' The book contains a summary of information in regard to the telegraph and telephone in addition to that about wires. — Van Antwerp, Bragg, & Co. have just ready 'Eclectic Physical Geography,' containing 30 charts and 151 cuts and diagrams. — G. P. Putnam's Sons will publish immediately an *édition de luxe* of 'The President's Message,' printed in large type, small quarto, with sixteen full-page moral and graphic illustrations from original designs by Thomas Nast; also the Questions of the Day edition of the same, with annotations by R. R. Bowker, which has been delayed for some important additional material. — Cupples, Upham, & Co. will publish shortly a new book by W. H. H. (Adirondack) Murray. It will be descriptive of the north-western side of the American continent. — Funk & Wagnalls have just issued in

pamphlet form 'The Presidential Campaign of 1896 — a Scrap-Book of Chronicle,' by the author of 'The Battle of Bietigheim.' The occasion is the presidential campaign of 1896, when the combined forces of socialism, anarchy, and atheism meet their Waterloo at the hands of an aroused, living, active American patriotism. — D. Appleton & Co. publish 'A History of the United States and its People,' by Edward Eggleston. They have also just ready in the International Scientific Series 'The Origin of Floral Structures through Insect and Other Agencies,' by the Rev. George Henslow, professor of botany, Queen's College; and 'Seven Conventions,' by A. W. Classon, which refers to the Federal convention, five of the ratifying conventions, and the Charleston convention of 1860, and is designed as an aid to the study of the Constitution. — William Henry Hurlbert has just published in Edinburgh a book entitled 'Ireland under Coercion — the Diary of an American.' Mr. Hurlbert concludes that landlords are good and alone deserving of sympathy, and that the nationalist peasants are vicious, dishonest, and, as a rule, much too leniently treated. — Sir Morell Mackenzie is at work on his reply to the recently published attack upon him by the German physicians. His answer will be shortly published in book form simultaneously in England and Germany. Messrs. Sampson Low, Marston, & Co. will be the English publishers. — L. J. Veen, Amsterdam (Holland), has just published the first part of a 'Dictionary of National Biography,' by J. G. Frederiks and F. Jos. van den Branden, assisted by a number of prominent men of letters in the Netherlands. The work will be completed in fifteen parts. — W. Drysdale & Co., Montreal, Canada, have just ready a new Canadian work, entitled 'The Young Seigneur, or, Nation-Making,' by Wilfrid Chateaucclair. The chief aim of this book, the author says, is to map out a future for the Canadian nation, which has been hitherto drifting without a plan. A lesser purpose of it is to make some of the atmosphere of French Canada understood by those who speak English. — Ticknor & Co. announce among their September books, 'Western China,' a journey to the great Buddhist centre of Mount Omei, by the Rev. Virgil C. Hart, B.D.; and 'A Short History of the Secession War,' by Rossiter Johnson, author of 'The History of the War of 1812-15.'

— Mr. Norman J. Fake, assistant to Professor Wiley, chemist of the Agricultural Department, was accidentally drowned while bathing in the Potomac on Saturday, Aug. 11. He was a young man of great promise, already an analyst of much skill, enthusiastic in his work.

— Professor Wiley of the Agricultural Department will complete his long investigation of the adulteration of lards in about six weeks. He will then take up the subject of the adulteration of sugars, molasses, and honey.

— *The Edinburgh Scotsman* of Aug. 16 states that on the day before, Mr. C. Piazzi Smyth, in consequence of advancing years, retired from the offices of astronomer royal for Scotland, and professor of practical astronomy in the University of Edinburgh, which he has filled for the long period of forty-three years. These important positions are in the gift of the Crown, and, although correspondence with the secretary for Scotland on the subject of his retirement has not yet been finally completed, Professor Smyth has, as already indicated, ceased from active duty, having handed over the keys of the Royal Observatory, in terms of an arrangement with Lord Lothian, to the first assistant astronomer, Mr. Thomas Heath, B.A. A week hence Professor Smyth, who is in his seventieth year and is still hale and hearty, will leave the official residence, 15 Royal Terrace, Edinburgh, and take up his abode ultimately in England. The late astronomer royal was born of English parents in the city of Naples, the roof under which he first saw the light being so close to Vesuvius that every now and then both house and garden were covered with showers of black sand. Prior to coming to Edinburgh he was for ten years at the Cape of Good Hope, in the capacity of first assistant astronomer in the Royal Observatory there, under Sir Thomas Maclear. During that time Professor Smyth went through a large amount of rough work in measuring an arc of the meridian along the mountains of the west coast of Africa. Altogether, therefore, he has spent fifty-three years of his life in observatory work. Professor Smyth, in a recent conversation, went into some detail as to his labors at the Royal Observa-

tory, and his reasons for resigning. His reason for proposing retirement to Lord Lothian, he remarked, was not only advancing years, but despair of ever being able to do any thing good, or compete with other observatories, when the government continued to refuse to do what their own commission recommended.

— Prof. E. J. Loomis of the Nautical Almanac Office is about to visit the Rocky Mountains on a vacation trip. While there he will assist his son-in-law, D. P. Todd, director of the Amherst College Observatory, in making scientific observations, astronomical, spectroscopic, and photographic. The expedition starts from Boston, and goes by the way of Montreal and the Canadian Pacific Railroad to the most elevated point in the Rocky Mountains reached by that railway. There the party will stop, and select the highest point near at hand, and conveniently accessible for the erection of a temporary observatory. Professor Todd goes out under the auspices of the Harvard College Observatory.

— C. N. Caspar of Milwaukee publishes the first instalment of Part I. of his 'Mail Book Auction.' Two copies of this list, which contains only the titles of books actually in stock, are sent to librarians and private book-collectors. One of these lists may be used to affix, after the respective titles of the works desired, the price the bidder is willing to pay per volume for each work. The second copy of the list, marked with the same bids, should be kept for reference. The advantages of this strictly new arrangement are conspicuous, and, above all, labor-saving. Old books in most cases have no market-value, and are, as a rule, worth different prices to different persons. Librarians and others may, through this opportunity, obtain books at their own prices. The books will be shipped to the first bidder, if the offer proves acceptable; otherwise the bids will be filed, and the books kept for four weeks for competition of offers which may arrive during this period, after which time they will be sent out without reserve to the highest bidder. All books on this list are warranted to be perfect, complete, and in good condition, and they are in their original cloth binding, if not otherwise specified. They will be forwarded at the expense of the purchaser. No charge is made for packing, cases, or cartage.

— The New York Agricultural Experiment Station (Peter Collier, director), Geneva, N.Y., proposes to carry out this next year experiments on the influence of fertilizers on the chemical composition of plants, with analyses of the feeding-stuffs, and feeding and digestion experiments.

— Mr. Ellery C. Huntington, A.B., of Amherst College, Massachusetts, will form classes in physical culture at the beginning of session, 1888-89, at the University of Virginia. The work under personal supervision of the instructor will consist of (1) class exercise with light (wooden) dumb-bells, (2) class drill with chest weights, (3) class exercise with Indian clubs. In addition, each student is to be examined physically and measured at least once a year. On the basis of this examination, a handbook of developing exercise will be made out and given to him, with exercises marked that are adapted to his individual need.

— A despatch from London, Aug. 27, announces the death of Philip Henry Gosse, F.R.S., the English naturalist, aged seventy-eight years. Mr. Gosse was born at Poole, Eng., in 1810, went to Newfoundland when a boy of seventeen, eight years later removed to lower Canada, and then travelled in this country, studying zoölogy and entomology, and making a long stop in Alabama. He was made an F.R.S. in 1856. He was the father of Edmund W. Gosse, the critic and poet.

— The Agricultural Department is organizing five new experimental stations for the study of sorghum and its manipulation, — three in Kansas, one in New Jersey, and one in Louisiana. The appropriation for this work this year is one hundred thousand dollars, larger than it has ever been before.

— Ohio and Michigan are better provided with public-school libraries than any other States. The former has 191 and the latter 154 volumes for every 100 pupils in average attendance. In the Southern States no public-school libraries of any consequence are reported.